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ABSTRACT

An examination of instructional costs and productivity was conducted in a national study of publicly supported colleges and universities. Of an initial pool of institutions selected from two national associations of colleges and universities, 101 participated including 58 comprehensive institutions, 22 doctoral institutions, 16 research institutions, and 5 liberal arts institutions. Data analysis looked at four ratios: student credit hours taught per full time equivalent (FTE) faculty; FTE students taught per FTE faculty; direct institutional cost per student credit hour, and direct instructional cost per FTE student taught. Each ratio is displayed by institutional classification and academic discipline. Findings included the following: (1) doctoral institutions showed heavier teaching loads than comprehensive or research institutions and at lower instructional cost levels; (2) doctoral institutions were less costly than comprehensive institutions in the humanities, mathematics, computer sciences and behavioral and social sciences; (3) comprehensive institutions were less costly in fine arts, natural and physical sciences, business curricula, and preprofessional curricula; (4) research institution generally spent more per FTE student taught than either comprehensive or doctoral institutions; and (5) regular faculty on appointment were the single strongest contributor to direct instructional expenditures. Appendixes contain extensive tables of data and other information on participating institutions. (JB)

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Interinstitutional Comparison of Instructional Costs and Productivity, by Academic Discipline: A National Study

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A Paper Presented at the Annual Forum
Of the Association for Institutional Research
New Orleans, Louisiana
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Jean Endo
Editor
Forum Publications

ABSTRACT

An examination of instructional costs and productivity was conducted in a national study of publicly supported colleges and universities. Employing a well tested and easily replicated data collection methodology, a sample of member institutions from the National Association of State Universities and Land Grant Colleges (NASULGC) and the American Association of State Colleges and Universities (AASCU) provided cost and productivity data for over 2,000 academic programs and departments. This study examined those data for cost and productivity patterns and differences along a broad spectrum of institutional variables. The relationships between and among those variables and instructional cost and productivity measures are reported.

Interinstitutional Comparison of Instructional Costs and Productivity, by Academic Discipline: A National Study

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Introduction

In an era of scarce fiscal resources for American higher education, it is essential that institutional planning focus on maximizing productivity while concurrently containing costs. (Massy, 1989; Zemsky and Massy, 1990; Middaugh and Hollowell, 1992a) While it is a relatively straightforward proposition to determine whether or not expenditures are being contained, assessing the enhancement of productivity is far more complex. There is little agreement on common currencies for measuring academic costs or productivity within disciplines. And there is woefully little interinstitutional data at the departmental and/or discipline level which would enable one institution to assess where it stands vis-a-vis others.

Middaugh and Hollowell (1992b) developed a conceptual framework for examining instructional costs within specific academic departments at an institution, and for determining whether instructional costs are offset or mitigated in any way by fiscal resource generation in non-instructional activity within the department. Middaugh (1993), at the 1993 Association for Institutional Research Forum in Chicago, fully described a methodology for data collection, analysis, and presentation, underpinned by the Middaugh/Hollowell conceptual framework, which

is widely accepted and used at a major research university.

Middaugh and Hollowell (1992b) argue that there are specific production/output variables that can be measured across departments in a given institution, or between departments at different institutions. These variables include: a) total student credit hours taught, b) full time equivalent students taught, c) full time equivalent faculty, d) direct instructional cost, and e) total sponsored research and service activity. These data enable the calculation of five specific productivity ratios:

1. Student Credit Hours Taught/FTE Faculty
2. FTE Students Taught/FTE Faculty
3. Direct Instructional Cost/Student Credit Hour
4. Direct Instructional Cost/FTE Student Taught
5. Sponsored Research and Service Activity/FTE Faculty

The five ratios provide an estimation of the relationship between teaching and other non-instructional productivity activities, i.e., research and service, across academic departments and/or disciplines. The ratios further permit a reasonable examination of the offset of instructional costs through revenue generation from non-instructional activity. While certainly not a complete picture of departmental productivity and efficiency, the ratios provide a basis for initial discussion and assessment of the relationship between cost and output, and for determining a department's position with respect to those variables among peers and aspiration groups.

A central tenet in the Middaugh/Hollowell framework and in

the Middaugh methodology is that each is generally replicable at any college or university using data that are readily at hand. This paper reports the results of a national data collection effort designed to test the general replicability of the framework and methodology, and the utility of the data generated therefrom.

This study is a first, descriptive phase in the analysis of the survey data. Subsequent papers will focus on other issues such as explanation and equation modeling.

Methodology

A survey instrument was developed at the University of Delaware in early 1993 to collect baseline instructional productivity and cost data, as well as expenditure data for sponsored research and service activity. Information was requested at both the total institution and departmental or programmatic level for the 1991-92 academic year and 1992 fiscal year to ensure that each institution had the opportunity to provide complete and audited information. The instructional workload data requested included total credit hours taught at the undergraduate and graduate levels; total headcount enrollment in courses offered; full time equivalent (FTE) faculty; and percentage of regular faculty on appointment who hold tenure. The survey also asked for direct instructional expenditures and expenditures for separately budgeted research and public service activity. The operating premise in requesting these data, which

are annually reported at the institutional level on the IPEDS Survey of Institutional Finances, is that if data can be aggregated to the institutional level, they can be disaggregated back to the department/program level.

Academic departments and disciplines were listed on the survey by Classification of Instructional Program (CIP) Codes for 35 curricula commonly offered at colleges and universities, with the opportunity for institutions to add CIP codes for additional programs for which they wished benchmarking data, if available. Institutions were asked to provide data at the most reasonable CIP code aggregation. For example, if an institution had a department of education or a department of engineering with a number of education or engineering subdisciplines (e.g., educational administration, teacher education, curriculum and instruction; civil, mechanical, chemical engineering, etc.), with faculty teaching across the subdisciplines, then the instructions asked that data be aggregated up to "Education" (13.XX) or "Engineering" (14.XX).

The survey was pilot tested among five institutions across the spectrum of Carnegie Classification types from comprehensive to research institutions. The pilot schools were George Mason University (Doctoral II), University of Delaware (Research II), University of Minnesota - Duluth (Comprehensive I), University of North Carolina - Greensboro (Doctoral I), and University of Wyoming (Research II). These institutions provided useful recommendations with respect to both definitional issues and data

analysis strategies. Appropriate modifications were made to the research design to enhance data consistency and integrity.

Upon finalization of the survey format and research design, a letter soliciting institutional participation in a national study of instructional costs and productivity was sent to a sample of 320 institutions belonging to the National Association of State Colleges and Land Grant University (NASULGC) and/or the American Association of State Colleges and Universities (AASCU). The letter was signed by the President of the principal researcher's institution and was addressed to the president of each college or university in the sample. A postage-paid postcard requesting the institution's intent to participate and appropriate contact person was also enclosed, along with a chapter reprint from a New Directions for Institutional Research volume describing the Middaugh/Hollowell (1992b) framework. At the request of members of the Higher Education Data Sharing Consortium (HEDS), an additional ten survey packages were sent to privately-chartered members of that group. A total of 180 institutions initially indicated their intent to participate, with 101 ultimately returning completed surveys. These included 58 Carnegie Comprehensive institutions, 22 Doctoral institutions, 16 Research institutions, and 5 Liberal Arts institutions. (See Appendix A for a list of participants.) Of the 101 surveys received, three contained incomplete data and were unusable, and four were received too late to be included in this analysis.

Data, by academic discipline, were entered into a master

data file for each of the participating institutions, and individual institutional summaries were generated. The summaries were proof read at the University of Delaware, and were then mailed to the respective participant for final verification.

Data analysis focused upon those CIP codes/academic disciplines for which a minimum of 15 institutional responses were received. Data were initially sorted by academic discipline, and by the Carnegie classification of the respondents therein. Four ratios were examined: 1. Student Credit Hours Taught/FTE Faculty; 2. FTE Students Taught/FTE Faculty; 3. Direct Instructional Cost/Student Credit Hour; 4. Direct Instructional Cost/FTE Student Taught.

FTE Faculty were defined in the data collection process as the sum of FTE department chairs and regular FTE faculty on formal contract/appointment at the institution, and FTE supplemental faculty. The latter were defined as adjunct faculty, professionals and other employees who teach but whose primary job responsibility was non-instructional, teaching assistants, and other persons who would not normally be viewed as regular faculty but who nonetheless teach. "FTEness" was calculated for supplemental personnel by assuming that the normal administered teaching load is 12 semester credit hours. Total teaching credit hours for supplemental personnel are then divided by 12 to arrive at full time equivalency.

FTE Students Taught were calculated from student credit hours. Total undergraduate student credit hours taught

throughout the academic year were divided by 30 at institutions on a semester calendar and 45 for those on a quarter system. Graduate student credit hours were divided by 24 for semester calendars and 30 for quarter calendars to arrive at student full time equivalency. While different institutions may use different divisors in calculating "FTEness", these were the values most commonly cited by the majority of the study sample. The intent in using these values was to get a reasonable estimation of full time equivalency while applying a uniform standard to interinstitutional data.

Each of the four aforementioned ratios were arrayed by Carnegie institutional classification within the respective academic disciplines. "Comprehensive Institutions" contained both Comprehensive I and II, "Doctoral" embraced Doctoral I and II schools, while Research I and II universities comprise the "Research" component. Liberal Arts I and II institutions responded to the survey, but were so few in number as to be potentially identifiable within the data array. Therefore, while the study results were shared with them, their data were not reported out to other institutions in the interest of confidentiality.

Not surprisingly, the ratios generally vary widely within each Carnegie aggregation within each academic discipline. "Outlier" respondents, i.e., those institutions which show such wide variance from the means as to exert undue impact upon any statistical procedures, were removed from the sample. As a first

step, those institutions where an obvious data error was evident were immediately labelled as outliers and excluded from any statistical evaluation. An initial mean or average ratio was then calculated for the "Comprehensive," "Doctoral," and "Research" arrays within each academic discipline. Because of the broad variance in ratios despite institutional verification of the data, it was decided that a conservative approach to excluding cases would be taken. Hence, only those institutions falling at least two standard deviations above or below the initial mean ratio were identified as outliers. A refined mean was then calculated for each Carnegie aggregation, excluding the outliers from the statistic.

Data Analysis

Table 1, located at the end of this paper, examines the refined means for each of the four ratios (Student Credit Hours/FTE Faculty, FTE Students Taught/ FTE Faculty, Direct Instructional Cost/Student Credit Hour, and Direct Instructional Cost/FTE Student Taught), arrayed by Carnegie grouping and by department/program. The working hypothesis prior to data collection was that Comprehensive institutions, with a primary mission of teaching undergraduates, would have higher workload and lower cost ratios than Doctoral institutions, which have significant graduate student enrollment. In turn, Doctoral institutions would teach more and cost less than Research institutions, where graduate research activity is more evident.

As a first step in assessing the extent to which the expected pattern holds true, the refined means for each of the four ratios were organized into seven general curricular areas: Humanities, Fine Arts, Natural and Physical Sciences, Mathematics and Computer Science, Behavioral and Social Sciences, Business, and Preprofessional Curricula. An index was calculated for each discipline within the curricular area, for the aggregate curricular area, and for all disciplines combined. In establishing the index, the mean ratio for Comprehensive institutions was set at 1.00. The mean ratio for Doctoral and Research institutions were then examined as a proportion of the mean for Comprehensive institutions. If the working hypothesis held true, Doctoral and Research institutions would have respectively successively smaller workload indices than 1.00, and respectively successively larger cost indices than 1.00. The curricular grouping strategy enables determination as to whether the proposition that Comprehensive institutions teach more and cost less is generally true, and whether it is true among departments with curricular affinities.

While Research institutions almost always have lower, more costly instructional workloads than Comprehensive institutions, the expected progressive decrease in workload from Comprehensive to Doctoral to Research institutions did <u>not</u> generally occur, <u>nor</u> did the expected progressive increase in direct instructional costs from Comprehensive to Doctoral to Research institutions. The more common pattern was to see Doctoral institutions with

heavier teaching loads than either Comprehensive or Research institutions, and at direct instructional cost levels below that of Comprehensive and Research institutions.

The hypothesized ratio patterns emerged only within the Fine Arts area, pronouncedly so in Theater and Music, and to a lesser extent in Art. The phenomenon of higher Doctoral teaching loads and lower Doctoral instructional costs was pervasive in the Humanities, Natural and Physical Sciences, and Mathematics and Computer Science curricular areas, while the results were mixed among the Behavioral and Social sciences, Business and Preprofessional curricular areas. The remainder of this paper will probe for greater understanding of these observations.

Data from certain departments within specific Carnegie institutional groupings were insufficient to allow meaningful statistical analysis at the discrete department or programmatic level. Consequently, data from departments and programs were grouped into the broader curricular groupings displayed in Table 1. Specifically:

Humanities: Communication, English, Foreign Languages and Literature, Philosophy

Fine Arts: Art, Music, Theater

Natural and Physical Sciences: Biology, Chemistry, Geology, Physics

Mathematics and Computer Science: Mathematics, Computer Science

Behavioral and Social Sciences: Psychology, Anthropology, Economics, Geography, History, Political Science, Sociology

Business Curricula: Accounting, Finance, Business Administration

Preprofessional Curricula: Education, Engineering, Nursing

Within this grouping framework, the 1,741 departments or programs reporting data are arrayed by Carnegie type as displayed in Table 2:

Table 2: Department/Programs Reporting Data, Arrayed by Curricular Grouping and Carnegie Institution Type

	Comprehensive	Doctoral	Research
Humanities	177	57	55
Fine Arts	130	42	42
Natural & Physical Sciences	166	61	59
Mathematics & Computer Science	94	29	29
Behavioral & Social Sciences	270	100	94
Preprofessional Curricula	92	33	32
Business Curricula	105	40	34
TOTAL	1,034	362	345

In looking at instructional productivity and cost, two specific ratios will be examined: FTE students Taught per FTE Faculty, and Direct Instructional Cost per FTE Student Taught. Use of FTE Students as opposed to total student credit hours captures the differential in teaching loads for undergraduate versus graduate classes.

Table 3, found at the end of this paper, displays the number

of departments or programs reporting FTE Student to FTE Faculty ratios within specific productivity ranges, by curricular grouping and by Carnegie institution type. In viewing Table 3, it is less important to look at the absolute number of departments/programs in each productivity range than it is to examine the relative proportion of Comprehensive, Doctoral, and Research units, respectively, within those ranges. The working hypothesis entering into this study was that Comprehensive institutions teach more, i.e., demonstrate higher FTE Student/FTE Faculty ratios than Doctoral institutions, which in turn, would teach more than Research institutions. On a proportional basis, Doctoral institutions display heavier average teaching loads, as measured by FTE students taught, than Comprehensive institutions in the Humanities, Natural and Physical Sciences, Mathematics and Computer Science, Behavioral and Social Sciences, and Business Curricula. Only in the Fine Arts and Preprofessional Curricula do Comprehensive institutions teach heavier loads than Doctoral institutions. As one might expect, Research institutions invariably have the lightest average teaching loads.

Direct instructional expenditures per FTE student taught also do not follow the originally hypothesized pattern in which Comprehensive institutions would be expected to show instructional expenditures lower than either Doctoral or Research institutions. Nor do the ratios uniformly mirror the data in Table 3 where, if Doctoral institutions consistently teach heavier loads than Comprehensive institutions, their costs would

logically be expected to be lower. Table 4, located at the end of this paper, displays the number of departments and programs reporting direct instructional expenditures per FTE student taught, falling within specific dollar ranges, arrayed by curricular grouping and by Carnegie institution type. Doctoral institutions, when examined on a proportional basis, are less costly than Comprehensive institutions in the Humanities, Mathematics and Computer Science, and Behavioral and Social Sciences. Comprehensive institutions are less costly in Fine Arts, Natural and Physical Sciences, Business Curricula, and Preprofessional Curricula. Research institutions generally spend more per FTE student taught than either comprehensive or Doctoral institutions.

If the relationship is ambiguous between teaching loads, as measured by FTE students per FTE Faculty, and instructional costs, as measured by Direct Instructional Expenditures per FTE Student Taught, other factors may well be primary drivers in determining the relative expense of instructional programs. In order to assess which of those variables in this study might contribute to instructional cost - and with what relative importance and at what level of significance - a stepwise multiple regression was used. This phase of the cost study is purely descriptive. Its purpose is to identify those factors which are related to direct instructional expenditures, and to assess the significance of that relationship. Since we are not yet building predictive cost models - although that will be a

later phase of cost analysis - stepwise regression is an appropriate tool for achieving the current descriptive objectives.

The following variables were entered into the analysis:

1. FTE Faculty - Regular: Those individuals with teaching contracts. Includes tenured, tenure-track, and other full time and permanent part time teaching personnel. Their salaries and benefits, as well as the support costs they generate, are components of direct instructional expenditures.

2. Supplemental Faculty: Adjunct faculty, professionals who teach on occasion, graduate teaching assistants, and others with instructional duties but who do not hold regular teaching contracts. Supplemental teaching payments, stipends, etc. become more or less significant components of direct instructional costs, depending on how extensively these faculty are used.

3. Percent of Faculty With Tenure: The percentage of those tenure eligible faculty who, in fact, hold tenure, and whose salaries and benefits become more or less an annual "constant" within direct instructional expenditures.

4. Undergraduate FTE Students Taught and
5. Graduate FTE Students Taught: The number of students taught is not irrelevant to direct instructional expenditures, nor is the extent to which a student body is more or less graduate in nature. By separately examining undergraduate FTE students taught and graduate FTE students taught, the relative importance of numbers can be inferred where undergraduates are significant, while the relative importance of graduate teaching to expense can be inferred where graduate FTE is significant.

6. Geographic Region and
7. Population Density: Logic dictates that where an institution is located may affect cost. Faculty salaries vary by geographic region; for example, salaries in New York or California, on average, are higher than those in Mississippi or Utah. Similarly, salaries at a metropolitan university might be expected to be higher than at a rural university. Institutions were coded with a Geographic Region value (Northeast, Southeast, Midwest, Southwest, Plains/Mountains, and Western/Pacific) and with a population density variable (Metropolitan, City, Small Town, and Rural). Appropriate dummy variables were then created. Appendix B displays the state aggregations for geographic

region and the definitions for population density.

From the above set of variables, a subset of regressors was selected using Efroymson's (1960) stepwise regressor selection procedure. Hoerl, Scheunmeyer, and Hoerl (1986) show that stepwise regression is insensitive to multicollinearity. Hence, variance inflation factors (VIF) are used to detect collinearity among variables. Marquardt's (1970) work suggests that VIF values greater than 10 indicate that multicollinearity is a serious problem. Appropriate criteria were used in developing the equations in this study.

These variables were entered stepwise into a multiple regression equation with direct instructional expenditures as the dependent variable. The decision was made to use stepwise regression in order to identify only those variables which contribute to direct instructional expenditures in a statistically significant fashion, and to estimate the relative importance of that contribution vis-a-vis other significant variables. Equations were developed for each of the three Carnegie institutional groupings within each of the seven curricular aggregations used in this study.

Table 5 displays the unstandardized coefficients, T-values, and R-squared values for the 21 equations generated in this analysis. In eight (8) instances, the original equation yielded a statistically insignificant constant term and generally unacceptable VIF values. In those cases, an alternative equation with no intercept was developed. Table 5 suggests that the

explanatory variables predict instructional costs well: typically, between 85% and 95% of the variability in direct instructional expenditures is accounted for. There were few outliers, using four standard deviations from the mean as the acceptable range.

T-values are displayed in Table 5 for those variables which were statistically significant in the final stepwise equation. The analysis suggests that, far and away, the most important factor in direct instructional expenditures is regular faculty. The finding is consistent with the personnel-intensive nature of higher education, and the fact that salaries and benefits frequently constitute three-fourths and more of instructional budgets.

Supplemental faculty statistically significantly contribute to direct instructional expenditures in 8 of the 21 equations. Not surprisingly, the relationship is a negative one in Research institutions in Humanities and Business Curricula. Large sections of English and Foreign Language courses taught by teaching assistants on minimal stipend are not uncommon at Research institutions, nor are large sections of Accounting or Business Administration taught by adjunct faculty at rates substantially below those earned by regular faculty.

Early discussions with colleagues hypothesized that the percentage of faculty with tenure would be a significant factor in direct instructional expenditures in that it constitutes a fixed "carrying charge" from year to year, and seemingly

restricts the flexibility of a department or program in managing that expenditure level. Yet tenure rate was significant in only 3 of 21 equations - at Doctoral and Research institutions in the Humanities, and at Comprehensive institutions in the Behavioral and Social Sciences. This would seem to suggest that either tenure rate is not all that important, or it is collinear with regular faculty in most equations.

The number of FTE graduate students taught was a significant component in direct instructional expenditures at Research institutions in 5 of 7 curricular groupings. Comprehensive institutions, with an altogether different mission, had undergraduate FTE students taught as significant in 5 of 7 curricular groupings.

No broad, clear pattern of geography or population density related costs appeared. Comprehensive institutions in the Southeast and Southwest showed geography to be a negative "contributor" to instructional cost, while location in the Western/Pacific area, when significant, tended to make instruction more costly.

In summary, regular faculty on appointment are the single strongest contributor to direct instructional expenditures. The undergraduate teaching or graduate research mission of an institution also appears to have important implications in instructional cost levels. Simplistic interpretation of these data might lead to the conclusion that an institution can reduce direct instructional expenditures simply by reducing the number

of faculty on appointment. In fact, instructional expenditures would be reduced, but at what other costs to the institution? Faculty at Research institutions, and to a somewhat lesser extent at Doctoral institutions, are given reduced teaching loads in the expectation that external funding will be generated for research and service activity.

Table 6, located at the end of the paper, displays externally sponsored research and service expenditures per FTE faculty, by curricular grouping and by Carnegie institution type. The N's in Table 6 reflect only those institutions reporting a positive dollar value for research or service in their survey submission. A number of institutions reporting "zero" indicated that they had research or service expenditures, but could not disaggregate them to the department or program level. Hence, with ambiguity as to whether "zero" in fact meant no activity or inflexible accounting, only those institutions with positive values were used.

Not unexpectedly, Comprehensive institutions generate smaller amounts of external research and service funding than either Doctoral or Research institutions. What is surprising for this sample is that Doctoral institutions, with generally higher teaching loads (Table 3) and lower instructional costs (Table 4) than Research institutions, are not all that different with respect to dollar volume of external research and service activity.

Discussion and Recommendations for Further Study

The results of this study should be viewed as a reasonable first attempt at collecting meaningful interinstitutional data on instructional costs and productivity. The study clearly needs to be repeated at regular intervals to monitor patterns identified in the preceding analyses, and to refine and enhance the information taken from the survey data.

Three specific methodological areas need refinement. Defining curricular aggregations by CIP code grouping provided a common language for talking about programmatic areas in this initial data collection effort. Many survey respondents, particularly among Comprehensive institutions, found difficulty in precisely defining their programmatic offerings within the conventional CIP code matrix. Two schools with "Engineering" as the umbrella title for a department in which faculty teach in more than one engineering discipline, may have entirely different emphases, with one stressing electrical engineering while another stresses civil engineering. Similarly, not all "Music" or "Nursing" departments are the same. Some music departments stress performance, with essentially one-on-one instruction, while others stress music history and appreciation with large group instruction. Clinical nursing programs have fewer students per faculty (and hence, higher instructional costs) than general nursing programs owing to the need for direct hospital supervision. In replicating this study, a more consistent curricular aggregation strategy must be developed.

Definitions with respect to accounting for direct instructional, research, and service expenditures need to be refined to reflect the practice rather than the theory of financial reporting at institutions. Despite reporting aggregate institutional data for these elements on the Annual IPEDS Survey of Institutional Finances, a number of institutions found difficulty in disaggregating the data back to the department or programmatic level. Some of the difficulty may reside in the definitions posed in this initial data collection effort. Much of the difficulty resides in the way in which institutions engage in accounting. The two poles require resolution in future data collection efforts.

Finally, the data collection and analytical activities associated with this study are quite expensive. The University of Delaware absorbed all costs associated with this initial effort. As the number of institutions participating increases, costs will increase commensurately. External support for this project is essential.

Having acknowledged the limitations associated with this initial data collection, there are additional analyses that can grow out of this and subsequent instructional cost and productivity studies. This study has generated sufficient information for subsequent extended analysis directed at developing instructional cost models for each of the curricular groupings in each of the three Carnegie institution types. Using direct expenditures for instruction as the dependent variable,

one could regress the variables used in this descriptive phase, as well as additional data provided by survey participants, to develop predictive direct instructional cost models. The extent to which a faculty is reliant upon supplemental personnel, or the extent to which student credit hours taught are at the graduate level, may be among variables which may contribute to an enhanced predictive model.

Among several sets of variables competing to "explain" the regressand, the set which results in the smallest mean square error (MSE) should be selected. Two regressors that are closely correlated with each other may be exchangeable in the model, but one of them may decrease the MSE substantially more than the other, and hence, be a more suitable candidate for entry into a predictive model. An entering regressor may make insignificant some of the regressors selected in the descriptive phase of this study. The MSE criterion will be used to refine further the results presented in this study.

Once reliable predictive models have been developed, it is possible for an institution to use its own actual values for each variable and enter them into the equation to arrive at a predicted cost that is either greater or less than the actual value. The institution can then examine each of those component variables to understand why actual institutional data vary from the estimates.

When this study is replicated in the future, a key objective should be to increase the sample size, particularly at the

Doctoral and Research level. Increased numbers of participants allow analysis at the individual department/program level, where N's currently are too small, as opposed to curricular groupings.

Similarly, larger sample size would enable expanded exploration of sponsored research service activity among Doctoral and Research institutions. The current analysis suggests that Doctoral and Research institutions are comparable when sponsored funds/FTE faculty on appointment are examined. It is important to determine whether this observation is sample dependent, i.e., idiosyncratic to this specific study, or whether it is a generalizable observation. If the latter is the case, a host of policy questions are opened related to reduced teaching loads in return for research/service activity.

An expanded sample would allow participating institutions to identify specific comparators with whom to benchmark data. A richer pool of institutions, particularly among Doctoral and Research institutions, would enable the identification of institutionally identified data subsets.

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TABLES

TABLE 1

REFINED MEAN INSTRUCTIONAL PRODUCTIVITY AND COST RATIOS BY ACADEMIC DISCIPLINE BY CARNEGIE CATEGORY

	# Institutions Reporting	Student Credit Hours Per FTE Faculty	Index	FTE Students Taught Per FTE Faculty	Index	Direct Instructional Cost Per Student Credit Hour	Index	Direct Instructional Cost Per FTE Student Taught	Index
1 HUMANITIES									
COMMUNICATION									
- Comprehensive Institutions	40	541	1 00	18	1 00	87	1 00	2,660	1 00
- Doctoral Institutions	13	617	1 14	20	1 11	80	0 92	2,484	0 93
- Research Institutions	13	610	1 13	17	0 94	88	1 01	2,849	1 07
FOREIGN LANGUAGES AND LITERATURE									
- Comprehensive Institutions	46	443	1 00	14	1 00	101	1 00	3,233	1 00
- Doctoral Institutions	14	496	1 12	17	1 21	87	0 86	2,585	0 80
- Research Institutions	12	449	1 01	13	0 93	91	0 90	2,832	0 88
ENGLISH									
- Comprehensive Institutions	53	540	1 00	17	1 00	77	1 00	2,403	1 00
- Doctoral Institutions	16	552	1 02	17	1 00	76	0 99	2,332	0 97
- Research Institutions	15	450	0 83	14	0 82	85	1 10	2,730	1 14
PHILOSOPHY									
- Comprehensive Institutions	38	761	1 00	23	1 00	71	1 00	2,223	1 00
- Doctoral Institutions	14	760	1 00	23	1 00	67	0 94	2,096	0 94
- Research Institutions	15	729	0 96	23	1 00	73	1 03	2,363	1 06
Average Indices									
- Comprehensive Institutions			1 00		1 00		1 00		1 00
- Doctoral Institutions			1 07		1 08		0 93		0 91
- Research Institutions			0 98		0 92		1 01		1 04
2 FINE ARTS									
THEATER/PERFORMING ARTS									
- Comprehensive Institutions	34	506	1 00	16	1 00	100	1 00	3,140	1 00
- Doctoral Institutions	11	383	0 76	13	0 81	154	1 54	4,560	1 45
- Research Institutions	14	400	0 79	12	0 75	161	1 61	5,144	1 64
ART									
- Comprehensive Institutions	49	458	1 00	15	1 00	106	1 00	3,282	1 00
- Doctoral Institutions	15	452	0 99	15	1 00	105	0 99	3,249	0 99
- Research Institutions	14	393	0 86	13	0 87	126	1 19	3,885	1 18
MUSIC									
- Comprehensive Institutions	47	347	1 00	11	1 00	146	1 00	4,511	1 00
- Doctoral Institutions	16	291	0 84	9	0 82	168	1 15	5,196	1 15
- Research Institutions	14	275	0 79	9	0 82	195	1 34	6,071	1 35
Average Indices									
- Comprehensive Institutions			1 00		1 00		1 00		1 00
- Doctoral Institutions			0 86		0 88		1 23		1 20
- Research Institutions			0 81		0 81		1 38		1 39

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TABLE 1

REFINED MEAN INSTRUCTIONAL PRODUCTIVITY AND COST RATIOS, BY ACADEMIC DISCIPLINE, BY CARNEGIE CATEGORY

	# Institutions Reporting	Student Credit Hours Per FTE Faculty	Index	FTE Students Taught Per FTE Faculty	Index	Direct Instructional Cost Per Student Credit Hour	Index	Direct Instructional Cost Per FTE Student Taught	Index
3 NATURAL AND PHYSICAL SCIENCES									
BIOLOGY									
- Comprehensive Institutions	56	579	1 00	19	1 00	99	1.00	3,043	1.00
- Doctoral Institutions	16	657	1 13	22	1 16	91	0.92	2,805	0.92
- Research Institutions	15	508	0 88	16	0 84	133	1.34	4,398	1.45
CHEMISTRY									
- Comprehensive Institutions	49	498	1 00	17	1.00	124	1.00	3,815	1.00
- Doctoral Institutions	16	596	1 20	20	1 18	119	0.96	3,734	0.98
- Research Institutions	15	551	1 11	17	1.00	150	1.21	4,563	1.20
GEOLOGY									
- Comprehensive Institutions	19	580	1 00	19	1.00	105	1.00	3,391	1.00
- Doctoral Institutions	14	616	1 06	21	1.11	98	0.93	3,033	0.89
- Research Institutions	15	450	0 78	14	0.74	183	1.74	6,284	1.85
PHYSICS									
- Comprehensive Institutions	42	500	1 00	16	1.00	121	1.00	3,729	1.00
- Doctoral Institutions	15	534	1 07	18	1.13	125	1.03	3,994	1.07
- Research Institutions	14	410	0 82	13	0.81	188	1.55	5,886	1.58
Average Indices									
- Comprehensive Institutions			1 00		1.00		1.00		1.00
- Doctoral Institutions			1 12		1.14		0.96		0.97
- Research Institutions			0 89		0.85		1.46		1.52
4 MATHEMATICS AND COMPUTER SCIENCE									
MATHEMATICS									
- Comprehensive Institutions	54	638	1 00	20	1.00	70	1.00	2,183	1.00
- Doctoral Institutions	16	716	1 12	23	1.15	67	0 96	2,083	0.95
- Research Institutions	15	587	0 92	18	0.90	98	1.40	3,135	1.44
COMPUTER AND INFORMATION SCIENCE									
- Comprehensive Institutions	40	527	1 00	17	1.00	103	1.00	3,204	1.00
- Doctoral Institutions	13	655	1 24	21	1.24	106	1.03	3,191	1.00
- Research Institutions	14	475	0 90	15	0 88	154	1.50	4,662	1.46
Average Indices									
- Comprehensive Institutions			1 00		1 00		1.00		1.00
- Doctoral Institutions			1 18		1 19		0.99		0.98
- Research Institutions			0 91		0 89		1.45		1.45

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TABLE 1

REFINED MEAN INSTRUCTIONAL PRODUCTIVITY AND COST RATIOS, BY ACADEMIC DISCIPLINE, BY CARNEGIE CATEGORY

	# Institutions Reporting	Student Credit Hours Per FTE Faculty	Index	FTE Students Taught Per FTE Faculty	Index	Direct Instructional Cost Per Student Credit Hour	Index	Direct Instructional Cost Per FTE Student Taught	Index
5 BEHAVIORAL AND SOCIAL SCIENCES									
PSYCHOLOGY									
· Comprehensive Institutions	53	802	1.00	27	1.00	66	1.00	2,011	1.00
· Doctoral Institutions	16	728	0.91	24	0.89	75	1.14	2,274	1.13
· Research Institutions	15	750	0.94	24	0.89	85	1.29	2,912	1.45
ANTHROPOLOGY									
· Comprehensive Institutions	16	789	1.00	25	1.00	93	1.00	2,796	1.00
· Doctoral Institutions	10	641	0.81	21	0.84	77	0.83	2,459	0.88
· Research Institutions	11	551	0.70	17	0.68	98	1.05	3,131	1.12
ECONOMICS									
· Comprehensive Institutions	29	757	1.00	22	1.00	78	1.00	2,469	1.00
· Doctoral Institutions	14	707	0.93	23	1.05	75	0.96	2,428	0.98
· Research Institutions	11	586	0.77	20	0.91	100	1.28	3,207	1.30
GEOGRAPHY									
· Comprehensive Institutions	27	804	1.00	26	1.00	67	1.00	2,128	1.00
· Doctoral Institutions	12	790	0.98	26	1.00	79	1.18	2,405	1.13
· Research Institutions	12	638	0.79	20	0.77	104	1.55	3,142	1.48
HISTORY									
· Comprehensive Institutions	51	728	1.00	24	1.00	71	1.00	2,192	1.00
· Doctoral Institutions	16	747	1.03	25	1.04	65	0.92	2,998	1.37
· Research Institutions	15	674	0.93	21	0.88	82	1.15	2,635	1.20
POLITICAL SCIENCE									
· Comprehensive Institutions	45	764	1.00	24	1.00	74	1.00	2,284	1.00
· Doctoral Institutions	16	762	1.00	26	1.08	72	0.97	2,218	0.97
· Research Institutions	15	659	0.86	20	0.83	87	1.18	2,772	1.21
SOCIOLOGY									
· Comprehensive Institutions	49	802	1.00	27	1.00	63	1.00	1,933	1.00
· Doctoral Institutions	16	879	1.10	28	1.04	60	0.95	1,866	0.97
· Research Institutions	15	729	0.91	22	0.81	70	1.11	2,276	1.18
Average Indices									
- Comprehensive Institutions			1.00		1.00		1.00		1.00
- Doctoral Institutions			0.97		0.99		0.99		1.06
- Research Institutions			0.84		0.82		1.23		1.28

TABLE 1

REFINED MEAN INSTRUCTIONAL PRODUCTIVITY AND COST RATIOS, BY ACADEMIC DISCIPLINE, BY CARNEGIE CATEGORY

	# Institutions Reporting	Student Credit Hours Per FTE Faculty	Index	FTE Students Taught Per FTE Faculty	Index	Direct Instructional Cost Per Student Credit Hour	Index	Direct Instructional Cost Per FTE Student Taught	Index
6 BUSINESS CURRICULA									
ACCOUNTING									
- Comprehensive Institutions	35	689	1 00	21	1 00	87	1 00	2,725	1 00
- Doctoral Institutions	15	765	1 11	25	1 19	93	1 07	2,845	1 04
- Research Institutions	12	687	1 00	22	1 05	102	1 17	3,156	1 16
FINANCE									
- Comprehensive Institutions	23	657	1 00	22	1 00	94	1 00	2,844	1 00
- Doctoral Institutions	13	733	1 12	24	1 09	95	1 01	2,880	1 01
- Research Institutions	11	593	0 90	17	0 77	134	1 43	4,165	1 46
BUSINESS ADMINISTRATION									
- Comprehensive Institutions	47	647	1 00	21	1 00	87	1 00	2,676	1 00
- Doctoral Institutions	12	690	1 07	22	1 05	90	1 03	2,720	1 02
- Research Institutions	11	608	0 94	19	0 90	131	1 51	3,678	1 37
Average Indices									
- Comprehensive Institutions			1 00		1 00		1 00		1 00
- Doctoral Institutions			1 10		1 11		1 04		1 02
- Research Institutions			0 95		0 91		1 37		1 33
7 PROFESSIONAL CURRICULA									
EDUCATION									
- Comprehensive Institutions	50	547	1 00	18	1 00	101	1 00	3,019	1 00
- Doctoral Institutions	13	505	0 92	18	1 00	102	1 01	2,873	0 95
- Research Institutions	12	384	0 70	13	0 72	188	1 86	5,459	1 81
ENGINEERING									
- Comprehensive Institutions	12	367	1 00	11	1 00	242	1 00	8,486	1 00
- Doctoral Institutions	8	280	0 76	12	1 09	185	0 76	5,573	0 66
- Research Institutions	11	305	0 83	10	0 91	297	1 23	8,861	1 04
NURSING									
- Comprehensive Institutions	30	248	1 00	8	1 00	204	1 00	6,250	1 00
- Doctoral Institutions	12	242	0 98	9	1 13	191	0 94	5,735	0 92
- Research Institutions	9	222	0 90	7	0 88	323	1 58	9,437	1 51
Average Indices									
- Comprehensive Institutions			1 00		1 00		1 00		1 00
- Doctoral Institutions			0 89		1 07		0 90		0 84
- Research Institutions			0 81		0 84		1 56		1 45
OVERALL AVERAGE INDICES									
- Comprehensive Institutions			1 00		1 00		1 00		1 00
- Doctoral Institutions			1 00		1 04		1 00		1 01
- Research Institutions			0 88		0 86		1 31		1 32

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TABLE 3: FTE Students Taught to FTE Faculty Ratios, Reported by Curricular Grouping, by Carnegie Institution Type

		FTE STUDENTS/FTE FACULTY				
		Less Than 20	20 to 29	30 to 39	40 to 49	50 or More
HUMANITIES						
- Comprehensive Depts./Programs	N	121	44	9	2	1
	%	(68.4)	(24.9)	(5.1)	(1.1)	(0.6)
- Doctoral Depts./Programs	N	29	26	2	0	0
	%	(50.9)	(45.6)	(3.5)	-	-
- Research Depts./Programs	N	36	12	5	0	2
	%	(65.5)	(21.8)	(9.1)	-	(3.6)
FINE ARTS						
- Comprehensive Depts./Programs	N	116	13	1	0	0
	%	(89.2)	(10.0)	(0.8)	-	-
- Doctoral Depts./Programs	N	40	1	1	0	0
	%	(95.2)	(2.4)	(2.4)	-	-
- Research Depts./Programs	N	41	1	0	0	0
	%	(97.6)	(2.4)	-	-	-
NATURAL & PHYSICAL SCIENCES						
- Comprehensive Depts./Programs	N	109	49	4	3	1
	%	(65.7)	(29.5)	(2.4)	(1.8)	(0.6)
- Doctoral Depts./Programs	N	30	26	5	0	0
	%	(49.2)	(42.6)	(8.2)	-	-
- Research Depts./Programs	N	50	9	0	0	0
	%	(84.7)	(15.3)	-	-	-
MATH & COMPUTER SCIENCE						
- Comprehensive Depts./Programs	N	58	32	1	3	0
	%	(61.7)	(34.0)	(1.1)	(3.2)	-
- Doctoral Depts./Programs	N	8	18	3	0	0
	%	(27.6)	(62.1)	(10.3)	-	-
- Research Depts./Programs	N	20	9	0	0	0
	%	(69.0)	(31.0)	-	-	-
BEHAVIORAL & SOCIAL SCIENCES						
- Comprehensive Depts./Programs	N	90	113	46	18	3
	%	(33.3)	(41.9)	(17.0)	(6.7)	(1.1)
- Doctoral Depts./Programs	N	25	57	17	1	0
	%	(25.0)	(57.0)	(17.0)	(1.0)	-
- Research Depts./Programs	N	49	38	6	1	0
	%	(52.1)	(40.4)	(6.4)	(1.1)	-
BUSINESS CURRICULA						
- Comprehensive Depts./Programs	N	46	50	8	1	0
	%	(43.8)	(47.6)	(7.6)	(1.0)	-
- Doctoral Depts./Programs	N	9	24	6	0	1
	%	(22.5)	(60.0)	(15.0)	-	(2.5)
- Research Depts./Programs	N	20	10	3	0	1
	%	(58.8)	(29.4)	(8.8)	-	(2.9)
PREPROFESSIONAL CURRICULA						
- Comprehensive Depts./Programs	N	68	19	2	2	1
	%	(73.9)	(20.7)	(2.2)	(2.2)	(1.1)
- Doctoral Depts./Programs	N	29	3	1	0	0
	%	(87.9)	(9.1)	(3.0)	-	-
- Research Depts./Programs	N	31	0	0	0	1
	%	(96.9)	-	-	-	(3.1)

TABLE 4: Direct Instructional Expenditures per FTE Student Ratios, Reported by Curricular Grouping, by Carnegie Institution Type

		DIRECT INSTRUCTIONAL COST/FTE STUDENT TAUGHT				
		Less Than $1000	$1000 to $1999	$2000 to $2999	$3000 to $3999	$4000 or More
HUMANITIES						
- Comprehensive Depts./Programs	N	4	44	72	38	19
	%	(2.3)	(24.9)	(40.7)	(21.5)	(10.7)
- Doctoral Depts./Programs	N	2	14	27	12	2
	%	(3.5)	(24.6)	(47.4)	(21.1)	(3.5)
- Research Depts./Programs	N	1	14	18	16	6
	%	(1.8)	(25.5)	(32.7)	(29.1)	(10.9)
FINE ARTS						
- Comprehensive Depts./Programs	N	1	9	33	35	52
	%	(0.8)	(6.9)	(25.4)	(26.9)	(40.0)
- Doctoral Depts./Programs	N	0	1	10	10	21
	%	-	(2.4)	(23.8)	(23.8)	(50.0)
- Research Depts./Programs	N	0	1	5	8	28
	%	-	(2.4)	(11.9)	(19.0)	(66.7)
NATURAL & PHYSICAL SCIENCES						
- Comprehensive Depts./Programs	N	0	18	47	46	55
	%	-	(10.8)	(28.3)	(27.7)	(33.1)
- Doctoral Depts./Programs	N	0	7	12	23	19
	%	-	(11.5)	(19.7)	(37.7)	(31.1)
- Research Depts./Programs	N	1	1	7	7	43
	%	(1.7)	(1.7)	(11.9)	(11.9)	(72.9)
MATH & COMPUTER SCIENCE						
- Comprehensive Depts./Programs	N	3	21	37	23	10
	%	(3.2)	(22.3)	(39.4)	(24.5)	(10.6)
- Doctoral Depts./Programs	N	1	11	9	5	3
	%	(3.4)	(37.9)	(31.0)	(17.2)	(10.3)
- Research Depts./Programs	N	0	3	6	7	13
	%	-	(10.3)	(20.7)	(24.1)	(44.8)
BEHAVIORAL & SOCIAL SCIENCES						
- Comprehensive Depts./Programs	N	15	106	97	34	18
	%	(5.6)	(39.3)	(35.9)	(12.6)	(6.7)
- Doctoral Depts./Programs	N	1	37	48	13	1
	%	(1.0)	(37.0)	(48.0)	(13.0)	(1.0)
- Research Depts./Programs	N	1	16	36	27	14
	%	(1.1)	(17.0)	(38.3)	(28.7)	(14.9)
BUSINESS CURRICULA						
- Comprehensive Depts./Programs	N	4	17	47	28	9
	%	(3.8)	(16.2)	(44.8)	(26.7)	(8.6)
- Doctoral Depts./Programs	N	1	10	13	12	4
	%	(2.5)	(25.0)	(32.5)	(30.0)	(10.0)
- Research Depts./Programs	N	0	3	7	9	15
	%	-	(8.8)	(20.6)	(26.5)	(44.1)
PREPROFESSIONAL CURRICULA						
- Comprehensive Depts./Programs	N	3	7	23	10	49
	%	(3.3)	(7.6)	(25.0)	(10.9)	(53.3)
- Doctoral Depts./Programs	N	0	1	6	6	20
	%	-	(3.0)	(18.2)	(18.2)	(60.6)
- Research Depts./Programs	N	0	1	2	0	29
	%	-	(3.1)	(6.3)	-	(90.6)

TABLE 5: Unstandardized Betas and T-Values for Variables, and R-Squared Value for Overall Stepwise Multiple Regression Equations, by Curricular Grouping and by Carnegie Institution Type

Dependent Variable: Total Direct Instructional Expenditures

	COMPREHENSIVE		DOCTORAL		RESEARCH	
	b	T	b	T	b	T
1. HUMANITIES						
- FTE Faculty - Regular	43091.5	14.022	74234.7	15.652	67609.8	11.056
- FTE Faculty - Supplemental	-----	-----	-----	-----	-8993.8	-2.211
- Percent Faculty With Tenure			9095.0	2.809	10039.5	2.416
- Undergraduate FTE Students Taught	617.5	5.246	-----	-----	-----	-----
- Graduate FTE Students Taught	-----	-----	-----	-----	6404.0	3.466
- Geographic Region						
Southeast	-105866.3	-2.583	-----	-----	-----	-----
Western/Pacific	249424.2	3.062	-----	-----	-----	-----
- Population Density						
City	-----	-----	-----	-----	494685.6	2.768
Small Town	-----	-----	-----	-----	415706.7	2.155
- Constant	86554.2	2.686	-811064.1	-2.968	-1025873.4	-3.186
Adjusted R-Squared =		0.87280		0.82162		0.88269
2. FINE ARTS						
- FTE Faculty - Regular	56510.4	19.995	49988.9	13.906	61819.5	11.799
- Percent Faculty With Tenure	1882.8	2.267	-----	-----	-----	-----
- Undergraduate FTE Students Taught	785.5	4.588	-----	-----	-----	-----
- Graduate FTE Students Taught	-----	-----	-----	-----	3166.9	3.038
- Geographic Region						
Midwest	-----	-----	261749.3	2.069	-----	-----
Western/Pacific	251349.2	3.441	-----	-----	-----	-----
- Population Density						
Metropolitan Region	230061.7	2.669	399544.9	3.409	-----	-----
City	-----	-----	-----	-----	272809.4	2.032
- Constant	-199526.1	-3.223	none	none	none	none
Adjusted R-Squared =		0.92558		0.93995		0.95876

TABLE 5: Unstandardized Betas and T-Values for Variables, and R-Squared Value for Overall Stepwise Multiple Regression Equations, by Curricular Grouping and by Carnegie Institution Type

Dependent Variable: Total Direct Instructional Expenditures

	COMPREHENSIVE		DOCTORAL		RESEARCH	
	b	T	b	T	b	T
3 NATURAL AND PHYSICAL SCIENCES						
- FTE Faculty - Regular	70171.2	28.837	39188.7	3.628	54555.3	6.301
- FTE Faculty - Supplemental	24859.6	4.376	-----	-----	16191.6	2.531
- Graduate FTE Students Taught	-----	-----	13803.1	4.051	5625.0	2.184
- Geographic Region						
Southeast	-104825.8	-3.432	-----	-----	-----	-----
Midwest	-----	-----	464258.4	3.476	-----	-----
Plains/Mountains	-158148.4	-2.416	-----	-----	-----	-----
Western/Pacific	-----	-----	-----	-----	1490635.5	4.260
- Population Density						
Metropolitan Region	-----	-----	-----	-----	891350.7	2.686
City	-----	-----	-----	-----	739361.7	4.069
- Constant	53827.1	1.794	none	none	none	none
Adjusted R-Squared =		0.89346		0.91129		0.94879
4 MATHEMATICS AND COMPUTER SCIENCE						
- FTE Faculty - Regular	17628.0	26.218	-----	-----	77000.8	16.977
- FTE Faculty - Supplemental	59518.5	2.351	-----	-----	-----	-----
- Undergraduate FTE Students Taught	-----	-----	1536.5	6.512	-----	-----
- Geographic Region						
Midwest	-----	-----	772447.9	4.264	-----	-----
- Population Density						
Metropolitan Region	-----	-----	-----	-----	-----	-----
City	-----	-----	-----	-----	571301.5	2.776
- Constant	none	none	279783.2	1.554	none	none
Adjusted R-Squared =		0.95001		0.72740		0.95342

TABLE 5: Unstandardized Betas and T-Values for Variables, and R-Squared Value for Overall Stepwise Multiple Regression Equations, by Curricular Grouping and by Carnegie Institution Type

Dependent Variable: Total Direct Instructional Expenditures

	COMPREHENSIVE		DOCTORAL		RESEARCH	
	b	T	b	T	b	T
5 BEHAVIORAL AND SOCIAL SCIENCES						
- FTE Faculty - Regular	56499.8	21.775	52916.6	13.817	58939.4	13.886
- FTE Faculty - Supplemental	-----	-----	-----	-----	20580.1	4.531
- Percent Faculty With Tenure	1650.7	3.616	-----	-----	-----	-----
- Undergraduate FTE Students Taught	287.5	3.593	-----	-----	-----	-----
- Graduate FTE Students Taught	-----	-----	1819.3	2.606	3427.4	3.471
- Geographic Region						
Northeast	-----	-----	-----	-----	165855.5	2.623
Midwest	-----	-----	280857.4	2.606	394104.5	5.531
Western/Pacific	-----	-----	-----	-----	491494.6	5.240
- Population Density						
Metropolitan Region	131704.2	2.801	-----	-----	-----	-----
City	-----	-----	-----	-----	404676.1	6.158
Small Town	-----	-----	-----	-----	299162.6	4.005
- Constant	-106899.4	-2.985	none	none	-398929.1	-5.040
Adjusted R-Squared =		0.87538		0.93508		0.93552
6 BUSINESS CURRICULA						
- FTE Faculty - Regular	60954.2	8.868	94716.7	9.920	49259.4	5.319
- FTE Faculty - Supplemental	6971.5	3.098	41950.1	2.765	-71976.8	-6.937
- Undergraduate FTE Students Taught	931.2	3.381	-----	-----	1323.0	3.766
- Graduate FTE Students Taught	-----	-----	-----	-----	5913.1	5.436
- Constant	-131479.3	-1.766	-326697.6	-2.176	125949.9	1.513
Adjusted R-Squared =		0.75760		0.89666		0.98116

TABLE 5: Unstandardized Betas and T-Values for Variables, and R-Squared Value for Overall Stepwise Multiple Regression Equations, by Curricular Grouping and by Carnegie Institution Type

Dependent Variable: Total Direct Instructional Expenditures

	COMPREHENSIVE		DOCTORAL		RESEARCH	
	b	T	b	T	b	T
7. PREPROFESSIONAL CURRICULA						
- FTE Faculty - Regular	45742.7	8.548	34671.3	2.587	96401.9	14.118
- Undergraduate FTE Students Taught	1911.3	6.993	1867.6	2.294	-----	-----
- Geographic Region						
Southeast	-367748.1	-2.343	-----	-----	-----	-----
Western/Pacific	1201057.2	3.358	-----	-----	-----	-----
- Population Density						
City	-----	-----	-----	-----	1464802.0	2.341
- Constant	none	none	797359.5	1.974	-1192184.0	-1.870
Adjusted R-Squared =		0.92862		0.79080		0.87768

TABLE 6: Sponsored Research and Service Expenditures per FTE Faculty on Appointment Ratios, Reported by Curricular Grouping, by by Carnegie Institution Type

		SPONSORED RESEARCH/SERVICE PER FTE FACULTY				
		Less Than $5000	$5000 to $9999	$10000 to $29999	$30000 to $49999	$50000 or More
HUMANITIES						
- Comprehensive Depts./Programs	N	53	6	2	1	0
	%	(85.5)	(9.7)	(3.2)	(1.6)	-
- Doctoral Depts./Programs	N	28	8	11	0	0
	%	(59.6)	(17.0)	(23.4)	-	-
- Research Depts./Programs	N	20	4	3	0	0
	%	(74.1)	(14.8)	(11.1)	-	-
FINE ARTS						
- Comprehensive Depts./Programs	N	33	9	1	0	0
	%	(76.7)	(20.9)	(2.3)	-	-
- Doctoral Depts./Programs	N	16	4	6	0	1
	%	(59.3)	(14.8)	(22.2)	-	(3.7)
- Research Depts./Programs	N	17	3	3	1	0
	%	(70.8)	(12.5)	(12.5)	(4.2)	-
NATURAL & PHYSICAL SCIENCES						
- Comprehensive Depts./Programs	N	45	12	14	5	4
	%	(56.3)	(15.0)	(17.5)	(6.3)	(5.0)
- Doctoral Depts./Programs	N	6	3	18	14	13
	%	(11.1)	(5.6)	(33.3)	(25.9)	(24.1)
- Research Depts./Programs	N	4	5	19	5	22
	%	(7.3)	(9.1)	(34.5)	(9.1)	(40.0)
MATH & COMPUTER SCIENCE						
- Comprehensive Depts./Programs	N	27	6	3	2	2
	%	(67.5)	(15.0)	(7.5)	(5.0)	(5.0)
- Doctoral Depts./Programs	N	11	7	7	1	0
	%	(42.3)	(26.9)	(26.9)	(3.8)	-
- Research Depts./Programs	N	9	5	10	1	0
	%	(36.0)	(20.0)	(40.0)	(4.0)	-
BEHAVIORAL & SOCIAL SCIENCES						
- Comprehensive Depts./Programs	N	84	14	11	2	1
	%	(75.0)	(12.5)	(9.8)	(1.8)	(0.9)
- Doctoral Depts./Programs	N	35	13	27	10	2
	%	(40.2)	(14.9)	(31.0)	(11.5)	(2.3)
- Research Depts./Programs	N	30	14	21	3	5
	%	(41.1)	(19.2)	(28.8)	(4.1)	(6.8)
BUSINESS CURRICULA						
- Comprehensive Depts./Programs	N	28	8	4	0	0
	%	(70.0)	(20.0)	(10.0)	-	-
- Doctoral Depts./Programs	N	14	4	5	3	1
	%	(51.9)	(14.8)	(18.5)	(11.1)	(3.7)
- Research Depts./Programs	N	17	2	1	0	1
	%	(81.0)	(9.5)	(4.8)	-	(4.8)
PREPROFESSIONAL CURRICULA						
- Comprehensive Depts./Programs	N	29	6	6	4	2
	%	(61.7)	(12.8)	(12.8)	(8.5)	(4.3)
- Doctoral Depts./Programs	N	7	6	11	2	5
	%	(22.6)	(19.4)	(35.5)	(6.5)	(16.1)
- Research Depts./Programs	N	9	3	6	7	4
	%	(31.0)	(10.3)	(20.7)	(24.1)	(13.8)

APPENDICES

APPENDIX A

Institutions Participating in University of Delaware 1993-94 Study of Instructional Costs and Productivity by Academic Discipline

Appalachaian State University (Comp. I)
Arkansas State University (Comp. I)
Augusta College (Comp. I)
Ball State University (Doctoral I)
California State University, Long Beach (Comp. I)
California State University, Northridge (Comp. I)
California University of Pennsylvania (Comp. I)
Central Connecticut State University (Comp. I)
Clarion University of Pennsylvania (Comp. I)
Cleveland State University (Doctoral II)
College of Charleston (Comp I)
College of the Holy Cross (Liberal Arts I)
East Carolina University (Comp. I)
East Texas State University (Doctoral II)
Eastern Michigan University (Comp. I)
Eastern Montana College (Comp. I)
Eckerd College (Liberal Arts I)
Edinboro University of Pennsylvania (Comp. I)
Francis Marion University (Comp. I)
Frostburg State University (Comp. I)
George Mason University (Doctoral II)
Georgia State University (Doctoral I)
Glenville State College (Comp. II)
Guilford College (Liberal Arts I)
Illinois State University (Doctoral II)
Jackson State University (Comp. I)
James Madison University (Comp. I)
Lake Superior State University (Comp. I)
LeMoyne College (Comp. II)
Lock Haven University of Pennsylvania (Comp. I)
Longwood College (Comp. I)
Mary Washington College (Comp. I)
McNeese State University (Comp. I)
Memphis State University (Doctoral I)
Miami University, Ohio (Doctoral I)
Mississippi State University (Research II)
Moorhead State University (Comp. I)
North Adams State College (Comp. I)
North Dakota State University (Doctoral II)
Northern Illinois University (Doctoral I)
Northern State University (Comp. I)
Northwestern State University, Louisiana (Comp. I)
Ohio State University (Research I)
Pennsylvania State University - Harrisburg (Comp. I)
Pittsburg State University (Comp. I)
Prairie View A&M University (Comp. I)
Ramapo College of New Jersey (Comp. I)
Rhode Island College (Comp. I)
Saint Cloud State University (Comp. I)
Saint Lawrence University (Liberal Arts I)
Southeastern Oklahoma State University (Comp. I)
Southern Illinois University - Carbondale (Research II)
Southwest Texas State University (Comp. I)
Southwestern Oklahoma State University (Comp. I)
State University of New York - Binghamton (Doctoral I)
State University of New York - Brockport (Comp. I)
State University of New York - Geneseo (Comp. I)
Tennessee Technological University (Doctoral II)
University of Alabama - Huntsville (Comp. I)
University of Alabama - Tuscaloosa (Doctoral I)
University of Arkansas - Fayetteville (Doctoral I)
University of California at Irvine (Research I)
University of California at Santa Barbara (Research II)
University of Cincinnati (Research I)
University of Connecticut (Research I)
University of Delaware (Research II)
University of Iowa (Research I)
University of Kansas (Research II)
University of Louisville (Doctoral I)
University of Maryland - Eastern Shore (Comp. II)
University of Miami (Research I)
University of Minnesota - Duluth (Comp,. I)
University of New Mexico (Research I)
University of North Carolina - Greensboro (Doctoral I)
University of North Dakota (Doctoral II)
University of Northern Colorado (Doctoral I)
University of Northern Iowa (Comp. I)
University of Rhode Island (Research II)
University of South Alabama (Comp. I)
University of South Florida (Doctoral I)
University of Southern Indiana (Comp. I)
University of Southern Mississippi (Doctoral II)
University of Southwestern Louisiana (Comp. I)
University of Texas - El Paso (Comp. I)
University of West Florida (Comp. I)
University of Wisconsin - LaCrosse (Comp. I)
University of Wisconsin - Milwaukee (Doctoral I)
University of Wisconsin - Stevens Point (Comp. I)
University of Wyoming (Research II)
Vassar College (Liberal Arts I)
Virginia Polytechnic Institute and State University (Research I)
Wake Forest University (Comp. I)
Western Carolina University (Comp. I)
Western Kentucky University (Comp. I)
Western Michigan University (Doctoral I)
Western Washington University (Comp. I)
Westfield State College (Comp. I)
William Patterson College (Comp. I)
Winona State University (Comp. I)
Withrop University (Comp. I)
West Virginia University (Research II)

APPENDIX B

GEOGRAPHIC REGIONS

Northeast

Maine
Vermont
New Hampshire
Massachusetts
Rhode Island
Connecticut
New York
Pennsylvania
Delaware
Maryland

Southeast

District of Columbia
Virginia
West Virginia
Kentucky
Arkansas
Tennessee
North Carolina
South Carolina
Georgia
Florida
Alabama
Mississippi
Louisiana

Midwest

Ohio
Michigan
Indiana
Wisconsin
Minnesota
Illinois
Iowa
Missouri

Southwest

Texas
Oklahoma
New Mexico
Arizona

Plains/Mountains

North Dakota
South Dakota
Nebraska
Kansas
Montana
Wyoming
Colorado
Idaho
Utah

Western/Pacific

Washington
Oregon
California
Nevada
Alaska
Hawaii

POPULATION DENSITY

Metropolitan Area:	Population of 500,000 or more
City:	Population of 50,000 to 499,999
Small Town:	Population under 50,000
Rural:	Located outside any center of concentrated population